

## **REMARKS**

Claims 1-29 and 49-50 were examined and rejected. Claims 30-37 and 38-48 have been previously canceled. Applicants amend claims 1, 13, 19 and 49. Amendments to claims 1, 19, and 49 are supported at least at paragraphs 8, 26, 30 and 34-35; and Fig. 2A of the application. Amendments to claim 13 are supported at least at paragraphs 8, 26, 30, 32 and 34-35; and Fig. 2B of the application.

Applicants thank the Patent Office for the comments in the *Response to Arguments* second paragraph of page 14 of the current Office Action and have amended the claims as suggested by the Examiner to require a heterojunction of two halides by claiming two semiconductor layers consisting of semiconductor material forming a heterojunction.

Applicants respectfully request reconsideration of claims 1-29, 49 and 50, in view of at least the following remarks. Applicants submit additional claim 51 for consideration and submit that no new matter is added therein as claim 51 is supported at least at paragraphs 26, 30, 234-35 and Fig. 2A of the application.

### **I. Claims Rejected Under 35 U.S.C. §102**

The Patent Office rejects claims 1-5, 7, 14, 16-18 and 20-26 under 35 U.S.C. § 102(b) as being anticipated by WO 02/067014 to Harel et al. ("Harel"). It is axiomatic that to be anticipated, every limitation of a claim must be disclosed within a single reference.

Applicants respectfully disagree with the rejection above of claim 1, for at least the reason that the cited references do not teach or suggest a photodetector comprising a first semiconductor layer consisting of a first semiconductor material; a second semiconductor layer consisting of a second semiconductor material, the first and second semiconductor layers forming a heterojunction and being halides, as required by claim 1. According to claim 1, for example and without providing limitation thereto, both of the semiconductor layers are halides, form a heterojunction, and are semiconductor materials (excluding other elements that would affect the basic characterization of the layers as semiconductor materials, as opposed to, for example, the prior art layers that may contain particles of a semiconductor in a polymeric binder).

On the other hand, Harel teaches producing wide band gap semiconductor particle-in-binder (PIB) composite detectors having particulate semiconductors combined with polymeric binders. (See page 4, lines 1-3) As noted, alerted to in the *Response to Arguments* section of the current Office Action, Applicants have amended the independent claims to claim the specific semiconductor layers consisting semiconductor material that form the heterojunction. Since the layers of Harel must include a polymeric binder, they do not describe or teach a semiconductor layer that consists of a semiconductor material, but only describe a layer including particles of semiconductor in a binder. For example, at best, each layer of Harel consists of two different materials, where only one is a semiconductor material. Thus, the particles and binder of each layer of Harel cannot describe a semiconductor layer consisting of a semiconductor material, as required by the claims.

For example, the layer of PIB in Harel, as a whole, may be a semiconductor layer, but clearly it does not consist of a semiconductor material - it consists of a semiconductor material plus a binder. The fact that together, the PIB still retains semiconductor properties does not mean that it consists of a semiconductor material. Harel does not teach such a layer, but instead, teaches away from such a layer because the primary purpose of Harel is to realize the benefit of using a particle in binder material (see Harel page 4, paragraph 2; page 3, paragraph 1 of Summary of Invention section; page 18, paragraph 3; and Figs. 6 and 12-13).

Applicants further disagree with the rejection above for at least the reasons of record cited in the prior response.

Consequently, the Patent Office has not identified and Applicants are unable to find any description in Harel that teaches or suggests a first semiconductor layer consisting of a first semiconductor material; a second semiconductor layer consisting of a second semiconductor material, the first and second semiconductor layers forming a heterojunction and being halides, as required by claim 1.

Hence, for at least the reasons above, including the reason that Harel teaches against the limitations above of claim 1, Applicants respectfully request the Patent Office withdraw the rejection of claim 1 above.

In addition to being based on an allowable base claim, Applicants also disagree with the rejection of dependent claims 2 and 4 for the additional reason that it is not implicit that Harel's semiconductor materials also have approximately the same bandgap. As noted above, Harel teaches particle in binder material. Thus, Applicants respectfully request the Patent Office provide a reference in support of the particle in binder materials of Harel having approximately the same bandgap as a halide material consisting of a semiconductor, as claimed. (e.g. see MPEP § 2144.03)

In addition to being based on an allowable base claim, Applicants also disagree with the rejection of dependent claims 17-18 for the additional reason that the particle in binder materials of Harel do not describe bandgaps within ten percent of each other as required by claims 17 and 18. An argument analogous to the one above for claim 2 applies here as well.

## **II. Claims Rejected Under 35 U.S.C. §103**

The Patent Office rejects claims 11-13, 15 and 19 under 35 U.S.C. § 103 (a) as being unpatentable over Harel. For a claim to be obvious every limitation of that claim must be taught by at least one properly combined reference.

Applicants disagree with the rejection above of independent claim 13 for at least the reason that the references do not teach or enable three semiconductor layers consisting of three semiconductor materials forming two heterojunctions; where the first and third material have a band gap of approximately 2.1eV; and where the second material has a band gap of approximately 2.3 eV and is thicker than the first and third materials, as required by claim 13. An argument analogous to the one above for claim 1 applies here as well to show that Harel does not teach the layers consisting of semiconductor material as required by claim 13.

Moreover, Harel does not teach the band gaps required by amended claim 13. An argument analogous to the one above for claim 2 applies here as well. Thus, Applicant respectfully requests the Patent Office provide a reference to show that the particle in binder of Harel has a band gap as required by the three layers of claim 13 (e.g. see MPEP § 2144.03).

In addition, Applicants disagree because Harel does not teach the third semiconductor layer consisting of a third semiconductor material, as required by amended claim 13. The Patent office cites page 31, second paragraph against this limitation. However, this section of Harel

only describes a chart comparing the sensitivity of lead iodide particle in binder with the sensitivity of mercuric iodide particle in binder. Thus, there is no teaching of three semiconductor layers consisting of three semiconductor materials, as required by claim 13. A similar argument applies to dependent claim 20.

Applicants disagree with the rejection above of independent claim 19 for at least the reason that the cited references do not teach or enable a first semiconductor layer consisting of a first semiconductor material; a second semiconductor layer consisting of a second semiconductor material, the first and second semiconductor layers forming a heterojunction and being halides, as required by claim 19. An argument analogous to the one above for claim 1 applies here as well.

The Patent Office rejects claims 1-5, 7-10, 14, 16-18, 24-29 and 49-50 under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent No. 6,437,339 to Lee et al. ("Lee").

Applicants respectfully disagree with the rejection above for at least the reason that Lee does not teach or enable a first semiconductor layer consisting of a first semiconductor material; a second semiconductor layer consisting of a second semiconductor material, the first and second semiconductor layers forming a heterojunction and being halides, as required by claim 1.

Lee describes a primary purpose of being able to provide x-ray images at low x-ray exposure levels (see Abstract and col. 3, lines 65-67) using the principles of operation of (1) amplifying the charge output of photoconducting material 300 using emission layer 400 and thin gas chamber 500; or (2) amplifying the charge output by semiconductor layer 2300 using gain layer 2500 (see col. 2, lines 32 – col. 4, line 56). However, Lee does not teach a heterojunction, formed of two different "types" of materials (e.g., p-type and n-type material forming an interface). Instead, Lee teaches using materials to form an electric field sufficient to bias one material in an avalanche mode based on an electric field in the material given by the dielectric constant of the materials =  $(K1/K2)$  where K1 is the dielectric constant of layer 2300 and K2 is the constant of the gain layer 2500 (see column 4, lines 26 through 44). Thus, Lee does not conceive of or teach a heterojunction, as required by the claims.

Thus, the Patent Office has not identified and Applicants are unable to find any teaching or enablement in Lee of a first semiconductor layer consisting of a first semiconductor material;

a second semiconductor layer consisting of a second semiconductor material, the first and second semiconductor layers forming a heterojunction and being halides, as required by claim 1.

Similarly, Applicants respectfully disagree with the rejection above of claim 49, for at least the reason that Lee does not disclose a photodetector comprising a first semiconductor layer consisting of a first semiconductor material; a second semiconductor layer consisting of a second semiconductor material, the first and second semiconductor layers forming a heterojunction and being halides, as required by claim 49.

An argument analogous to the one above for claim 1 applies here as well.

In addition, Lee does not teach or enable the first and second semiconductor layers consisting of p-type and n-type semiconductor materials as required by amended claim 49.

Applicants submit that any dependent claims not mentioned above, being dependent upon allowable base claims, are patentable over the cited references for at least the reasons explained above as well as additional limitations of those dependent claims.

Thus, Applicants respectfully request that the Patent Office withdraw the rejection of all claims as being unpatentable over the cited references.

**CONCLUSION**

In view of the foregoing, it is believed that all claims now are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666.

Respectfully submitted,

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**CERTIFICATE OF TRANSMISSION**

I hereby certify that this correspondence is being submitted electronically via EFS Web to the United States Patent and Trademark Office on the date below.

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6/17/09  
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